REMARKS

This paper responds to the Office Action dated on May 17, 2006.

No claims are amended, no claims are canceled, and no claims are added; as a result, claims 1, 2, 5-10, 13-15, 18-23, 26-31, 34–37, 51, 52, 54-56, and 62 are now pending in this application.

§103 Rejection of the Claims

Claims 1-2, 4-6, 14-15, 17-20, 51-52, 55-56 and 62 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano (U.S. Patent No. 5,810,923). Applicant respectfully traverses this rejection.

The cited references have all been previously discussed. Park is used to show that sputtering and evaporation are art recognized equivalents. Yano is used to show that the deposition temperature range, the use of atomic oxygen, and that smooth metal oxide surfaces are known..

Ma discloses a metal oxide gate dielectric formed of Zr or Hf alloyed with approximately 25% of a trivalent metal such as aluminum or lanthanum, formed by either sputtering in an oxygen ambient, co-sputtering in an oxygen ambient, chemical vapor deposition in an oxygen ambient, or evaporation and annealing in an oxygen ambient. There is a disclosed interface barrier 62 of 2-5 Å of silicon nitride or silicon oxynitride (see col. 2, line 17 and col. 6, line 9 and figures 12 and 13).

The Examiner admits in the second paragraph of section 2 on page 2 that Ma does not teach the use of electron beam evaporation, or a smooth surface, but states on the third line of page 3 that sputtering, chemical vapor deposition and evaporation deposition "have an art recognized equivalence". Applicant respectfully disagrees with the Examiner as to the equivalence of the three methods of deposition, and points to the present specification at least at page 6, starting on line 18, and on page 7, starting on line 20, which contrasts the use of a thermal evaporation technique for smooth surfaces and minimal unwanted byproducts such as silicides and oxides, such as appear in the cited reference of Ma in order to improve the surface

smoothness (see col. 6, lines 9-11). The Examiner's statement that the use of various deposition methods as being "equivalent" is simply incorrect as shown in the present specification, and the failure of the cited references to mention the differences is simply yet another argument in favor of their failure to perceive one of the problems being addressed by this disclosure. Applicant submits that figure 2b and the associated discussion on page 7 would make clear to one of ordinary skill in the art that a clean smooth surface for the transistor channel is not to be obtained by use of the prior typical methods of sputtering and chemical vapor deposition.

Similar to the above discussion, Applicant respectfully disagrees that there is any suggestion to one of ordinary skill in the art to use a pure metal rather than the trivalent metal doped film of Ma. The present specification at least at page 7, starting at line 5 explains that the material to be evaporated needs to be pure. The Examiner's argument that the express disclosure in Ma of a trivalent mixture level of 0 to 50% of aluminum or other trivalent material is not seen as in any way being the same as disclosing a 99.9999% pure zirconium. One of ordinary skill in the art would not understand Ma to be teaching a pure metal. Ma repeatedly discussion the use of a trivalent metal alloy, which would not suggest the use of very pure materials.

In view of the above noted arguments and the specific reasoning given in the prior response, Applicant respectfully submits that the suggested combination of references does not suggest the smooth surface, the need to use thermal evaporation methods, or the purity and characteristics of the source material.

Applicant respectfully submits once again that the Examiner has failed to provide some objective teaching from the cited reference showing any motivation to suggest changing the repeated discussed trivalent alloy metal to the pure metal of the present application. The Examiner has the burden under 35 USC § 103 to establish a *prima facie* case of obviousness. *In re Fine*, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d (BNA) 1596, 1598 (Fed. Cir. 1988). Neither Ma nor Yano give any possible reason why the use of a substantially pure metal would be a benefit, as opposed to their clear teaching of the use of alloyed metal.

Ma suggest that the insulator layer includes an interface barrier 62 of silicon nitride or silicon oxy-nitride (see col. 2, line 13 and col. 6, line 10). Ma does not suggest the use of a single element metal layer, since even if there were motivation to use a substantially pure metal,

the presence of an initial dielectric under the metal oxide would teach away from the claimed arrangement.

Specifically, Applicant respectfully submits that the suggested combination of Ma with Park and Yano fails to describe or suggest at least the claimed feature of a "... *substantially single element metal layer directly contacting the body region...directly contacting the body region* ..."", as recited in independent claims 1, 9, 14, 22, 30, 51, 55 and 62. The cited references do not suggest either a single element layer, or that the layer is directly contacting the body region. In view of the above, Applicant respectfully requests that this rejection be withdrawn.

Claims 8, 21 and 54 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano (U.S. Patent No. 5,810,923) and in further view of Moise (U.S. Patent No. 6,211,035). Applicant respectfully traverses this rejection.

The features of Ma, Park and Yano are discussed above. Moise is used to show that oxidizing in an inert ambient is known. Applicant submits that the Moise reference does nothing to cure the above-noted deficiencies in the combination of Ma, Park and Yano with regard to independent claims 1, 14 and 51, from which the claims in question depend. The suggested combination does not suggest the direct contact to the channel region, or the use of a substantially pure metal, or the substantial amorphousness of the deposited metal. Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 9-10 and 12-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano (U.S. Patent No. 5,810,923) and in further view of Moise (U.S. Patent No. 6,211,035). Applicant respectfully traverses this rejection.

The cited references have features discussed above. Applicant notes that the statement on page 8 of the outstanding Office Action with regard to claim 12 that "the metal of Park is 99.0% pure or higher" is incorrect, at least since claim 12 has been cancelled in the response dated October 24, 2005 to the Office Action dated August 23, 2005, and because a teaching of 99%

does not provide proper motivation to obtain the disclosed 99.9999% purity, especially in conjunction with a reference disclosing alloys of up to 50% with a trivalent metal such as Ma.

Applicant respectfully submits that the suggested combination fails to describe or suggest "*...evaporation depositing a substantially amorphous and substantially single element metal layer directly contacting the body region using electron beam evaporation, the metal being chosen from the group IVB elements of the periodic table; and oxidizing the metal layer using a krypton(Kr)/oxygen (O_2) mixed plasma process to form a metal oxide layer directly contacting the body region...*", as recited in claim 9. The reasoning is the same as given above. Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 22-23, 25-28, 30-31 and 33-36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano (U.S. Patent No. 5,810,923) and in further view of Maiti (U.S. Patent No. 6,020,024) and the admitted prior art (pages 1-4). Applicant respectfully traverses this rejection.

All the references except Maiti have been discussed numerous times. Maiti is used to show that transistor having a high dielectric constant metal oxide gate are known. Applicant submits that the addition of Maiti does nothing to cure the failures of the other references to describe or suggest at least the features of "*...evaporation depositing a substantially amorphous and substantially single element metal layer directly contacting the body region using electron beam evaporation, the metal being chosen from the group IVB elements of the periodic table* ...", as recited in claim 22. This is the same argument used above, that the cited references fail to suggest methods to keep the surface clean and smooth, and a gate directly on the body region. Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 29 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Ma (U.S. Patent No. 6,207,589) in view of Park (U.S. Patent No. 5,795,808) and Yano (U.S. Patent No. 5,810,923) and in further view of Maiti (U.S. Patent No. 6,020,024) and the admitted prior art (pages 1-4) and in further view of Moise (U.S. Patent No. 6,211,035). Applicant respectfully traverses this rejection.

The cited references have all been discussed above. Applicant respectfully submits that the combination of references, whether taken alone or in any combination, fails to describe or suggest at least the features of "*...evaporation depositing a substantially amorphous and substantially single element metal layer directly contacting the body region using electron beam evaporation, the metal being chosen from the group IVB elements of the periodic table ...*", as recited in claim 22, from which claim 29 depends.

Applicant respectfully submits that the combination of references, whether taken alone or in any combination, fails to describe or suggest at least the features of "*...oxidizing the metal layer to form a metal oxide layer directly contacting the body region, wherein the metal oxide layer has a smooth surface with a surface roughness variation of 0.6 nm...*" as recited in claim 30, from which claim 37 depends. As discussed above, the cited references fail to suggest methods to keep the surface clean and smooth, and the gate dielectric directly in contact with the body region. Applicant respectfully requests that this rejection be reconsidered and withdrawn.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney David Suhl at (508) 865-8211, or the undersigned attorney at (612) 349-9587 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

KIE Y. AHN ET AL.

By their Representatives,

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. Box 2938
Minneapolis, MN 55402
(612) 349-9587

Date 17 July 06

By _____
Timothy B. Clise
Reg. No. 40,957

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop AF, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 17 day of June, 2006.

Kate Gannon _____ _____

Name Signature